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15 December 1998

Ms. Sherida Larose
79 Ober Hill Road
Johnson, Vermont 05656

Re: *Initial Site Investigation Report*
LaRose's Market, North Hyde Park, Vermont

Dear Sherida:

As we discussed, enclosed is the *Initial Site Investigation Report* for LaRose's Market, located in North Hyde Park, Vermont. Please do not hesitate to contact me at 655-0011 if you have any additional questions or concerns.

Marin Environmental, Inc.

Eric J. Swiech
Hydrogeologist

enclosure

cc: Mr. Chuck Schwer, VT DEC
Mr. Ray Archbold

EJS/Ref: 98088C01.doc

State of Vermont

Department of Fish and Wildlife
Department of Forests, Parks and Recreation
Department of Environmental Conservation
State Geologist
RELAY SERVICE FOR THE HEARING IMPAIRED
1-800-253-0191 TDD>Voice
1-800-253-0195 Voice>TDD

AGENCY OF NATURAL RESOURCES
Department of Environmental Conservation
Waste Management Division
103 South Main Street/West Office
Waterbury, Vermont 05671-0404
(802) 241-3877
FAX (802) 241-3296

Letter of Transmittal

To: JIM BOWES
JOHNSON CO

Date: 8/4/99
SMS #: 98-2544
Site: LaRose Property
Subject: work plan request for the enclosed site per 8/4/99 telephone call

Enclosed please find:

X Copy of Report ___ Proposal ___ Copy of Letter
___ Request for Information ___ Your Requested Information

Copies	Date of Information	Description
1	12/15/98	ISI - LaRose Market Hyde Park VT

These are transmitted:

___ For your review ___ Approved as submitted ___ Resubmit ___ copies for approval
X For your information ___ Approved as noted ___ Submit ___ copies for distribution
___ Per your request ___ Returned for corrections

Comments: Here is the main ISI on the property. The job will be sample 4 existing wells, remove 1 - 550 gallon heating oil UST, install 1-3 new wells depending on site conditions.

Copy To: _____

Signed: Gerold Noyes
Gerold Noyes, Environmental Engineer

D:\MyFiles\My Documents\examples\Letter of Transmittal.wpd

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INITIAL SITE INVESTIGATION REPORT

LAROSE'S MARKET
North Hyde Park, Vermont

15 December 1998

Prepared for:

LaRose's Market
VT Route 100
North Hyde Park, Vermont 05655

Contact: Sherida LaRose
Phone: 802-635-7424

Prepared by:

Marin Environmental, Inc.
1700 Hegeman Avenue
Colchester, VT 05446

Contact: Eric J. Swiech
Phone: 802-655-0011

Marin Project # VT98-0088
Document # 98088isi

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EXECUTIVE SUMMARY

Marin Environmental, Inc. (**Marin**) has conducted an initial site investigation (ISI) at LaRose's Market, located on U.S. Route 100 in North Hyde Park, Vermont. The ISI included the installation of four soil borings/monitoring wells, collection of ground water samples from each monitoring well, and an evaluation of potential threats to nearby receptors. **Marin**'s findings related to this work are summarized as follows:

- Subsurface gasoline contamination was discovered at LaRose's Market on 18 September 1998 during the closure of two gasoline underground storage tanks (USTs). The removed tanks included an in-service, 2,000-gallon UST (UST #1), and an out-of-service, 1,000-gallon UST (UST#2). During the UST assessment, photoionization detector (PID) readings on soils were recorded as high as 1,899 parts-per-million.

- Based on available hydrogeologic and contaminant-distribution data, there appears to be two source areas at the site. The primary source area appears to be UST #2, located in the northern portion of the parking lot. UST #1, located in the southern end of the parking lot, appears to be a minor source area. The lateral and vertical extents of the dissolved-phase-contaminant plumes from both of the source areas have not yet been reasonably characterized with the present array of monitoring wells. Current information indicates that contaminant plumes from both sources overlap within 20 feet downgradient of the former USTs.

- Vermont Groundwater Enforcement Standards (VGESs) were exceeded for one or more gasoline-related volatile organic compounds (VOCs) in two source-area monitoring wells (MW-1 and MW-4), and in one off-site monitoring well (MW-2). Dissolved-phase-contaminant levels detected in MW-1, installed in the excavation during the UST closure, may be lower than actual contaminant conditions in this source area, since the screened interval of the well is located above the soils which exhibited the highest PID response.

- No free-phase product has been detected in any of the monitoring wells at the site.

- Several sensitive receptors have been identified in the vicinity of the petroleum releases including the Archbold's residence to the north, the Deuso's residence located to the northwest, the Congregational Church located to the west, and the Gihon River also to the west. The indoor-air quality of the Archbold's residence and the church does not currently appear to be at risk since these sensitive receptors are not located within the imprint of the contaminant plumes. Although no visual evidence of petroleum contamination was observed along the bank of the Gihon River, the

risk posed to this sensitive receptor cannot be determined at this time, as the down-gradient extent of contamination has not yet been defined. There is a potential risk of contaminant impact to the indoor air quality of the Deuso's residence, which is located directly downgradient of the contaminant plumes. However, this risk appears to be low due to the relatively low concentrations of the dissolved-phase-contaminant plumes, the absence of free-phase product at the site, and the receptor's distance from the source areas.

- Beneath the site, poorly-sorted very coarse to fine sands and gravel are present to approximately 12-16 feet below ground surface (bgs), underlain by a clayey-silt unit with interbedded horizontal clay and very-fine sand lenses. The sand and gravel unit apparently thickens to the west beneath Route 100 to greater than 20 feet, based on boring information from MW-2. The thickness of the clayey-silt unit and depth-to-bedrock were not determined during the boring program.

- Based on the 8 October 1998 hydrogeologic data, ground water in the unconfined surficial aquifer at the site appears to flow in a west-northwesterly direction toward the Gihon River. Ground water was encountered at depths ranging from approximately 9.5 to 14.5 feet bgs. The average horizontal hydraulic gradient of the local water table was approximately 11 percent (MW-4 to MW-2). The vertical hydraulic gradient and flow direction at the site is currently unknown.

Based on all the data collected at the site to date, **Marin** recommends the following:

1. Three additional water-table monitoring wells should be installed to characterize the lateral extents of the dissolved-phase plumes. One well should be located on the eastern side of Vermont Route 100, in the southwest corner of Mr. Ray Archbold's property. The other two wells should be advanced on the western side of Vermont Route 100, on Mr. Ken Deuso's property.
2. Two deep monitoring wells should be installed: one downgradient of the northernmost contaminant plume, and one adjacent to MW-1.
3. The newly installed wells, along with existing monitoring wells, should be sampled and analyzed for the possible presence of volatile petroleum compounds by EPA Method 8021B.
4. The basement of the Deuso residence should be visually inspected and screened for the possible presence of VOCs with a PID during the next few site visits.
5. Upon completion of the additional work, a report should be prepared which includes relevant tables and figures, and identifies an appropriate course of action for the site.

1.0 INTRODUCTION

This report details the results of an Initial Site Investigation (ISI) performed by Marin Environmental, Inc. (**Marin**) at LaRose's Market, located on U.S. Route 100 in North Hyde Park, Vermont (Figures 1 and 2, Appendix A). This report has been prepared by **Marin** on behalf of Sherida and Rhett LaRose, owners of the former underground storage tanks (USTs). The site investigation was conducted in accordance with the Vermont Department of Environmental Conservation (VT DEC) Expressway process following the discovery of subsurface petroleum contamination during the removal of two gasoline USTs on 18 September 1998.

1.1 Site Location and Physical Setting

The site is located on Vermont Route 100 in North Hyde Park, Vermont, approximately ¼ mile north of Vermont Route 100c (Figure 1, Site Location Map). One building, which serves as a convenience store in the front, and apartments in the rear, occupies the site (Figure 2, Site Map).

The ground surface in front, and immediately downgradient of the building, is generally flat, sloping gently to the northeast towards the Gihon River approximately 250 feet downgradient. The site is bound by private residences to the north and south, and Vermont Route 100 to the west. Additional residences and the Congregational Church are located across Route 100. The site and all nearby buildings are served by a municipal drinking-water system operated by the North Hyde Park Fire District #1, which draws water from an artesian well located at the south end of the village. The precise location of the well has not been determined at this time.

1.2 Site History

On 18 September 1998, two petroleum USTs were removed from the front of LaRose's Market. The removed USTs consisted of a 2,000-gallon in-service gasoline UST (UST #1), and a 1,000-gallon out-of-service gasoline UST (UST#2), both approximately 26 years old. UST #1 was located approximately 10 feet west of the storefront, in the southern end of the gravel parking lot, while UST #2 was located in the northern portion of the lot. The former pump island was located between the two USTs, approximately 16 feet west of the building. UST #2 was taken out of service circa 1997 due to a failed tightness test.

During closure operations, evidence of petroleum contamination was observed in both UST excavations. UST #1, and associated piping, appeared to be in fair condition at the time of removal,

with extensive rust and pits, but no obvious perforations. PID readings in the UST #1 excavation ranged from 0.0 ppm to 1,322 ppm, with the highest reading recorded approximately 10 feet below ground surface (bgs). UST #2 appeared to be in poor condition at the time of removal, with extensive rust and pits, and three obvious perforations in the bottom of the tank. PID readings in the UST #2 excavation ranged from 2.8 ppm to 1,899 ppm, with the highest reading recorded at the base of the excavation approximately 14 feet bgs. Ground water was encountered in both excavations at approximately nine feet bgs.

Due to the apparent impact to ground water, all soils excavated during the UST closures were backfilled. Using a backhoe, monitoring well MW-1 was installed in the UST#2 excavation at approximately 11 feet bgs. The boring log for MW-1 is included in Appendix B.

1.3 Objectives and Scope of Work

The objectives of this initial site investigation were to:

- evaluate the degree and extent of petroleum contamination in soil and ground water;
- qualitatively assess the risks to environmental and public health via relevant sensitive receptors and potential contaminant migration pathways; and
- identify potentially appropriate monitoring and/or remedial actions based on the site conditions.

To accomplish these objectives, **Marin** has:

- supervised the installation of three additional shallow monitoring wells;
- screened subsurface soils from the soil borings for the possible presence of volatile organic compounds (VOCs) using a photoionization detector (PID);
- collected and submitted ground-water samples from the on-site monitoring wells for laboratory analysis of volatile petroleum compounds by EPA Method 8021B;
- identified sensitive receptors in the area, and assessed the risk posed by the contamination to these potential receptors;
- evaluated the need for treatment and/or a long-term monitoring plan for the site; and
- prepared this summary report, which details the work performed, qualitatively assesses risks, provides conclusions, and offers recommendations for further action.

2.0 INVESTIGATIVE PROCEDURES AND RESULTS

2.1 Soil Boring / Monitoring Well Installation

On 2 October 1998, **Marin** supervised the completion of three soil borings/monitoring wells (MW-2, MW-3, and MW-4) to complement existing test-pit monitoring well MW-1 and characterize contaminant and hydrogeolgic conditions at the site (Figure 2 in Appendix A). Monitoring well MW-2 was installed across Route 100 on the church property, approximately 55 feet downgradient of the site's western property boundary, MW-3 was located approximately 36 feet northeast (upgradient) of the former USTs, and MW-4 was advanced immediately downgradient of former UST#1.

Beneath the site, poorly-sorted very coarse to fine sands and gravel are present to approximately 12-16 feet bgs, underlain by a clayey-silt unit with interbedded horizontal clay and very-fine sand lenses. The sand and gravel unit apparently thickens to the west beneath Route 100 to greater than 20 feet, based on boring information from MW-2 (geologic cross-section A-A', Appendix A). Ground water was encountered at depths ranging from approximately 9.5 to 14.5 feet bgs. The thickness of the clayey-silt unit and depth-to-bedrock were not determined during the boring program.

The soil borings were advanced by Adams Engineering (Underhill, Vermont) using a vibratory drilling method. Soil samples were collected in five-foot increments from each boring. Sample recovery was good to excellent, ranging from 60 to 100 percent. The samples obtained were screened for the possible presence of VOCs with a PID, and logged for lithology by a **Marin** hydrogeologist. All downhole drilling and sampling equipment was decontaminated during use as appropriate.

All of the monitoring wells were constructed with 1.5-inch-diameter schedule 40 poly-vinyl chloride (PVC) with flush-threaded joints. Well screens consisted of 0.010-inch factory-slotted, ten-foot screen sections, and were placed approximately five to eight feet into the water table. Sections of solid PVC were added to bring the tops of the well casings to approximately 0.5 feet bgs. Clean silica #1 filter sand was placed in the borehole annulus around each well screen extending approximately one foot above the slotted interval. A bentonite pellet seal, at least one-foot thick, was set above each well's sand pack. The remainder of the annular space around the solid PVC riser was backfilled with native material. The completed monitoring wells were

protected by flush-mounted steel roadboxes. Each well casing was topped with a water-tight expansion cap. Soil-boring and monitoring-well construction logs for newly completed monitoring wells are included in Appendix B.

To remove fine-grained sediment, monitoring wells MW-1, MW-2, and MW-3 were developed on 2 October 1998 using a peristaltic pump; MW-4 was developed on 8 October 1998 with a hand bailer. None of the monitoring wells contained free-phase product during development, and development water was discharged directly to the ground surface in the vicinity of each well. Newly installed wells were surveyed relative to existing site features, with an azimuth accuracy of (+/-) 1.0 feet, and an elevation accuracy of (+/-) 0.01 feet.

2.2 Soil-Screening Results

During the monitoring well installation program on 2 October 1998, soil samples were collected at discrete intervals for subsequent headspace screening with a PID. Elevated PID readings were measured on soil samples collected from source-area monitoring well MW-4 and downgradient monitoring well MW-2, while soils from upgradient monitoring well MW-3 did not yield PID readings above background levels.

At all boring locations, PID readings in the vadose zone were non-detect. The highest PID reading (8.3 parts-per-million) was recorded on saturated soils 14 to 15 feet bgs in monitoring well MW-4, located immediately downgradient of former UST#1. In MW-2, located approximately 55 feet downgradient of the former USTs, PID readings were 0.0 parts-per-million (ppm) except for one saturated soil sample from 19 to 20 feet bgs, where a reading of 4.9 ppm was observed. Therefore, the vertical extent of off-site contamination has not been reasonably defined at MW-2. PID screening results are included on the boring logs in Appendix B.

A Marin hydrogeologist screened soil samples from each soil boring for the possible presence of volatile organic compounds (VOCs) using a PhotoVac Model 2020 portable photoionization detector (PID). The PID was calibrated in the field with an isobutylene standard gas to a benzene reference.

2.3 Ground-Water Elevation Calculations and Flow Direction

Based on available hydrogeologic data, ground water in the unconfined surficial aquifer at the site appears to flow in a west-northwesterly direction toward the Gihon River. The average horizontal hydraulic gradient of the local ground-water table on 8 October 1998 was approximately 11

percent (MW-4 to MW-2). The vertical hydraulic gradient and flow direction at the site is currently unknown; additional information is required to evaluate the vertical hydraulic characteristics at the site. Water-level measurements and elevation calculations for 8 October 1998 are presented in Table 1; Figure 3 is the water-table contour map prepared using these data (Appendix A).

TABLE 1. Ground-Water Elevation Data

(Monitoring Date: 8 October 1998)

Well I.D.	Top of Casing Elevation (feet)	Depth to Water (feet, TOC)	Ground Water Elevation
MW-1	100.00	9.35	90.65
MW-2	99.16	14.46	84.70
MW-3	102.76	12.01	90.75
MW-4	99.51	9.03	90.48

Fluid levels were measured in the on-site monitoring wells on 8 October 1998. Depths to water ranged from 9.03 feet (MW-4) to 14.46 feet (MW-2) below top-of-casing. No free-phase product was observed in any of the monitoring wells. Static water-table elevations were computed for each monitoring well by subtracting the measured or corrected depth-to-water readings from the surveyed top-of-casing elevations, which are relative to an arbitrary site datum of 100.00 feet.

2.4 Ground-Water Sampling and Analysis

The 8 October 1998 ground-water analytical results indicate the shallow aquifer beneath the site and the adjacent property to the west-northwest are contaminated with gasoline-related volatile organic compounds (VOCs). Based on available hydrogeologic and contaminant-distribution data, there appears to be two source areas at the site. The primary source area appears to be UST #2, located in the northern portion of the parking lot. UST #1, located in the southern end of the parking lot, appears to be a minor source area. The lateral and vertical extents of the dissolved-phase-contaminant plumes from both of the source areas have not yet been reasonably characterized with the present array of monitoring wells. Current information indicates that contaminant plumes from both sources overlap within 20 feet downgradient of the former USTs.

Total dissolved-phase VOC concentrations ranged from non-detect in upgradient monitoring well MW-3, to 4,872.3 micrograms-per-liter (ug/L) in test-pit monitoring well MW-1. Vermont

Groundwater Enforcement Standards [1](VGESs) were exceeded for one or more VOCs in source-area monitoring wells MW-1 and MW-4, and in off-site monitoring well MW-2. Dissolved-phase-contaminant levels detected in MW-1, installed in the excavation during the UST closure, may be significantly lower than actual contaminant conditions in this source area, since the screened interval of the well is located above the soils which exhibited the highest PID response. Ground water analytical results are included in Table 2, and on the Contaminant-Distribution Map (Appendix A, Figure 4). Laboratory report forms are included in Appendix C.

TABLE 2. Ground-Water Quality Analytical Results

(Monitoring Date: 8 October 1998)

Well I.D.	MTBE	Benzene	Toluene	Ethyl-benzene	Total Xylenes	1,3,5 TMB	1,2,4 TMB	Napthalene	Total VOCs
MW-1	ND <20	ND < 20	231	87.3	1,790	757	1,750	257	4,872.3
MW-2	ND <1	ND < 1	ND <1	4.9	10.1	TBQ <1	5.4	ND <1	20.4
MW-3	ND <1	ND < 1	ND <1	ND < 1	ND < 1	ND <1	ND <1	ND <1	ND
MW-4	12.3	7.2	1.5	3.5	34.9	3.9	9.7	2.2	75.2
Duplicate	ND <20	ND < 20	242	87.1	1,890	776	1,820	242	5,057.1
Trip Blank	ND <1	ND < 1	ND <1	ND < 1	ND < 1	ND <1	ND <1	ND <1	ND
VGES	*40*	*5*	*1,000*	*700*	*10,000*	*4*	*5*	*20*	–

Results reported as parts per billion (ppb), unless noted otherwise.
ND = Compound not detected above indicated detection limit.
TBQ = Compound detected at trace levels below quantitation limit indicated.
TMB = Trimethylbenzene
VGES = Vermont Groundwater Enforcement Standard
Note: duplicate collected from MW-1

Ground-water samples were collected on 8 October 1998 from four monitoring wells (MW-1, MW-2, MW-3, and MW-4). Monitoring wells were purged and then sampled using dedicated bailers and dropline. Purge water was discharged directly to the ground in the vicinity of each well. Trip blank and duplicate samples were collected to ensure that adequate quality assurance/quality control (QA/QC) standards were maintained. All field procedures were conducted in accordance with **Marin** standard protocols.

[1] The Vermont DEC has established Groundwater Enforcement Standards (VGESs) for eight petroleum related VOCs, as follows: benzene - 5 ppb; toluene – 1,000 ppb; ethylbenzene - 700 ppb; xylenes – 10,000 ppb.; MTBE, a gasoline additive, - 40 ppb; napthalene – 20 ppb; 1,2,4 trimethylbenzene – 5 ppb; and 1,3,5 trimethylbenzene –4 ppb.

Ground-water samples were transported under chain-of-custody in an ice-filled cooler to Endyne, Inc. of Williston, Vermont. All samples were analyzed for the possible presence of volatile petroleum compounds by EPA Method 8021B. The compounds tested for included: benzene, toluene, ethylbenzene, total xylenes, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, naphthalene, and methyl tertiary butyl-ether (MTBE). Analytical results from the QA/QC samples indicate that adequate QA/QC was maintained during sample collection and analysis. None of the VOCs were detected in the trip blank. Analytical results for the blind field duplicate sample collected from MW-1 were approximately 96 percent of the original sample results. Table 2 also includes a summary of the QA/QC analytical results.

3.0 SENSITIVE RECEPTOR SURVEY AND RISK ASSESSMENT

3.1 Sensitive Receptor Survey

Marin conducted a survey to identify sensitive receptors in the vicinity of LaRose's Market that could potentially be impacted by residual and dissolved-phase contamination associated with the site. The following sensitive receptors were identified in the vicinity of LaRose's Market:

- the Gihon River, located approximately 250 feet west (downgradient) of the former gasoline USTs and pump island;
- Mr. Ray Archbold's residence, located approximately 28 feet north (upgradient) of the site;
- the basement of the Congregational Church, located approximately 60 feet west (downgradient) of former gasoline UST #1; and
- the basement of a private residence owned by Mr. Ken Deuso, located approximately 65 feet northwest (downgradient) of former gasoline UST #2.

The on-site building is built on an at-grade concrete-slab foundation, which is not likely to be impacted by residual soil or ground water contamination.

3.2 Risk Assessment

Marin assessed the risks that the residual soil and dissolved-phase subsurface contamination poses to the receptors identified above. In general, human exposure to petroleum related contamination is possible through inhalation, ingestion, or direct contact while impacts to environmental receptors are due either to a direct release or contaminant migration through one receptor to another or along a preferential pathway.

The results of our risk assessment are as follows:

- Inspection of a reach of the Gihon River, presumed to be hydraulically down-gradient of the releases, did not identify any visual or olfactory evidence of contaminant impact. However, because the down-gradient extents of the dissolved-phase contaminant plumes have not yet been adequately characterized, the risk posed to this sensitive receptor cannot be fully evaluated at this time.

- The indoor air quality of the Archbold's residence does not appear to be at risk since this sensitive receptor is located up-gradient of the releases.

- The indoor air quality of the church does not appear to be impacted at this time; no VOCs, via PID screening, were detected in the structure. The risk of future impact to this sensitive receptor appears to be low since available contaminant and hydrogeologic data suggest the church is located on the fringe of the southern dissolved-phase-contaminant plume.

- There is a potential risk of contaminant impact to the indoor air quality of the Deuso's residence, which is located directly down-gradient of the contaminant plumes. However, this risk appears to be low due to the relatively low concentrations of the dissolved-phase-contaminant plumes, the absence of free-phase product at the site, and the receptor's distance from the source areas. Access to the basement of this residence was not available during the field investigation, as well as on a subsequent, separate occasion. Therefore, the basement could not be visually inspected and screened for the possible presence of VOCs with a PID.

4.0 CONTAMINANT SOURCE DISCUSSION

Available hydrogeologic and contaminant-distribution data indicate there are two separate source areas for the identified gasoline contamination: one at the southern end of the parking lot, associated with former UST #1, and another at the northern portion of the property, related to former UST #2.

A 500-gallon heating-oil UST remains onsite, located in the rear of the convenience store. This UST represents an additional potential source for subsurface petroleum contamination on the property. However, no data have been generated to date to suggest a release has occurred from this UST. According to Mr. LaRose, the heating-oil UST is no longer in service.

No other potential sources of petroleum contamination were identified onsite or upgradient of the property.

5.0 CONCLUSIONS

Based on the results of the site investigation described above, **Marin** concludes the following:

- Subsurface gasoline contamination was discovered at LaRose's Market on 18 September 1998 during the closure of two gasoline underground storage tanks (USTs). The removed tanks included an in-service, 2,000-gallon UST (UST #1), and an out-of-service, 1,000-gallon UST (UST#2). During the UST assessment, photoionization detector (PID) readings on soils were recorded as high as 1,899 parts-per-million.

- Based on available hydrogeologic and contaminant-distribution data, there appears to be two source areas at the site. The primary source area appears to be UST #2, located in the northern portion of the parking lot. UST #1, located in the southern end of the parking lot, appears to be a minor source area. The lateral and vertical extents of the dissolved-phase-contaminant plumes from both of the source areas have not yet been reasonably characterized with the present array of monitoring wells. Current information indicates that contaminant plumes from both sources overlap within 20 feet downgradient of the former USTs.

- Vermont Groundwater Enforcement Standards (VGESs) were exceeded for one or more gasoline-related volatile organic compounds (VOCs) in two source-area monitoring wells (MW-1 and MW-4), and in one offsite monitoring well (MW-2). Dissolved-phase-contaminant levels detected in MW-1, installed in the excavation during the UST closure, may be lower than actual contaminant conditions in this source area, since the screened interval of the well is located above the soils which exhibited the highest PID response.

- No free-phase product has been detected in any of the monitoring wells at the site.

- Several sensitive receptors have been identified in the vicinity of the petroleum releases including the Archbold's residence to the north, the Deuso's residence located to the northwest, a church located to the west, and the Gihon River also to the west. The indoor air quality of the Archbold's residence and the church does not currently appear to be at risk since these sensitive receptors are not located within the imprint of the contaminant plumes. Although no visual evidence of petroleum contamination was observed along the bank of the Gihon River, the risk posed to this sensitive receptor cannot be determined at this time, as the downgradient extent of contamination has not yet been defined. There is a potential risk of contaminant impact to the indoor air quality of the Deuso's residence, which is located directly down-gradient of the contaminant plumes.

However, this risk appears to be low due to the relatively low concentrations of the dissolved-phase-contaminant plumes, the absence of free-phase product at the site, and the receptor's distance from the source areas.

- Beneath the site, poorly-sorted very coarse to fine sands and gravel are present to approximately 12-16 feet below ground surface (bgs), underlain by a clayey-silt unit with interbedded horizontal clay and very-fine sand lenses. The sand and gravel unit apparently thickens to the west beneath Route 100 to greater than 20 feet, based on boring information from MW-2. The thickness of the clayey-silt unit and depth-to-bedrock were not determined during the boring program.

- Based on the 8 October 1998 hydrogeologic data, ground water in the unconfined surficial aquifer at the site appears to flow in a west-northwesterly direction toward the Gihon River. Ground water was encountered at depths ranging from approximately 9.5 to 14.5 feet bgs. The average horizontal hydraulic gradient of the local water table was approximately 11 percent (MW-4 to MW-2). The vertical hydraulic gradient and flow direction at the site is currently unknown.

6.0 RECOMMENDATIONS

On the basis of the results of this investigation and the conclusions stated above, **Marin** recommends the following:

1. Three additional water-table-monitoring wells should be installed to better characterize the lateral extents of the dissolved-phase plumes. One well should be located on the eastern side of Vermont Route 100, in the southwest corner of Mr. Ray Archbold's property. The other two wells should be advanced on the western side of Vermont Route 100, on Mr. Ken Deuso's property.

2. Two deep monitoring wells should be installed: one downgradient of the northernmost contaminant plume, and one adjacent to MW-1.

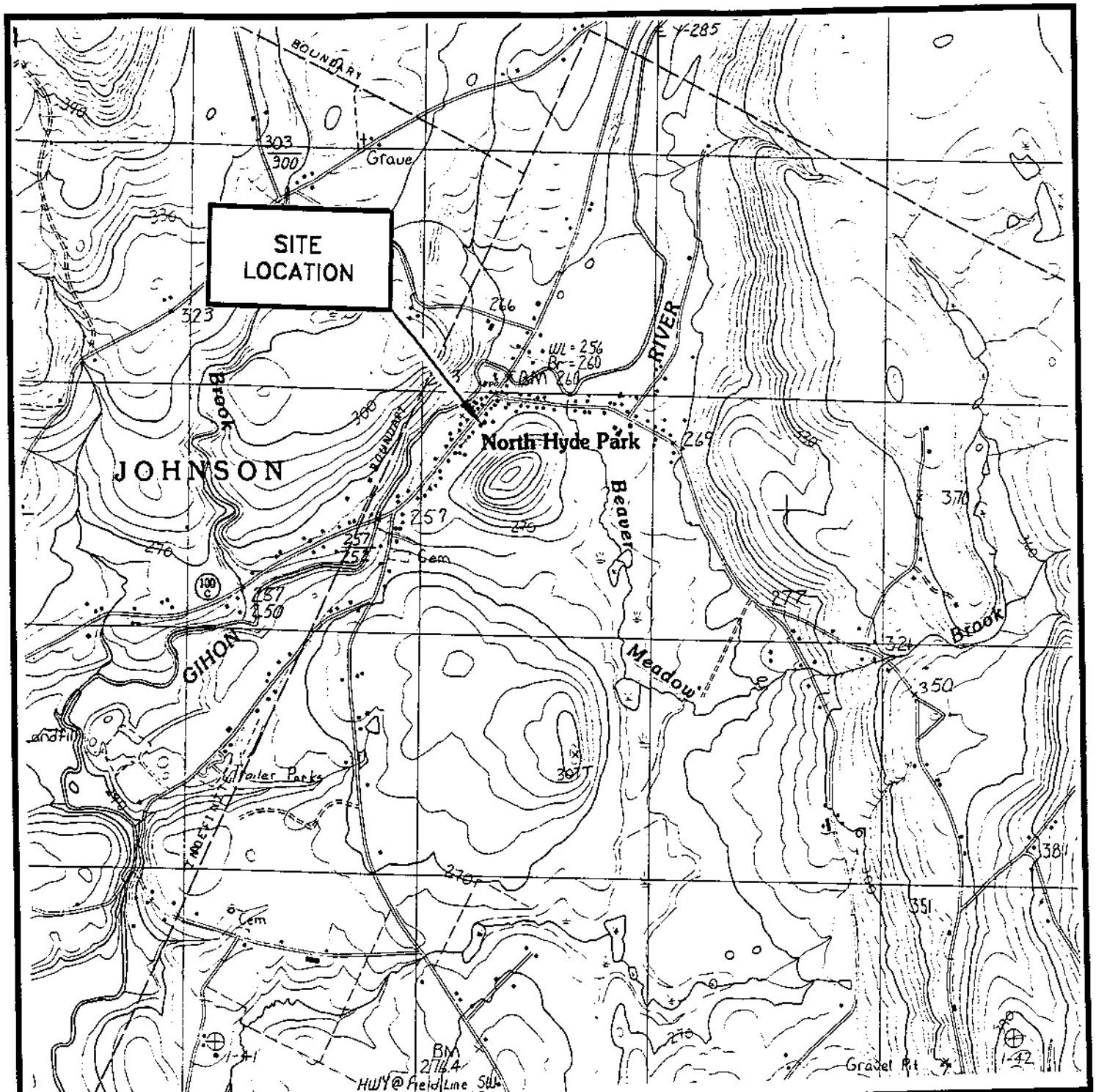
3. The newly installed wells, along with existing monitoring wells, should be sampled and analyzed for the possible presence of volatile petroleum compounds by EPA Method 8021B.

4. The basement of the Deuso's residence should be visually inspected and screened for the possible presence of VOCs with a PID during the next few site visits.

5. Upon completion of the additional work, a report should be prepared which includes relevant tables and figures, and identifies an appropriate course of action for the site.

APPENDIX A

Figures



MARIN
ENVIRONMENTAL

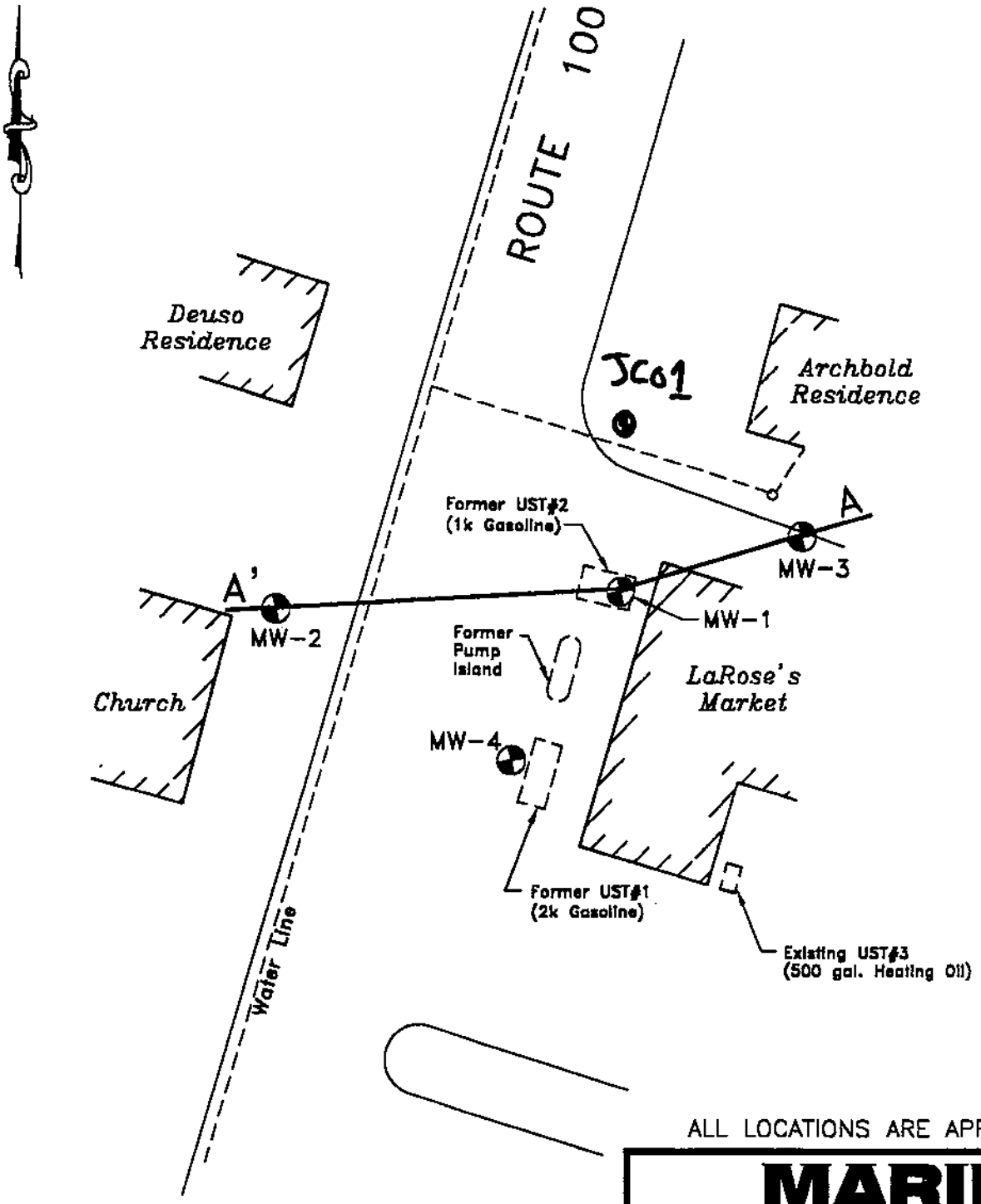
TITLE: FIGURE 1. Site Location Map

Source: U.S.G.S. Topographic Map
Eden Quadrangle, Vermont—Lamoille Co., 7.5' Series, Provisional Edition 1988.

SITE: LAROSE'S MARKET

QUADRANGLE LOCATION

DRAWN BY: MJB	DATE: 11/16/98	SCALE: 1"= 2000'
APPROVED BY: ES		FILE No.: 980088sloc



ALL LOCATIONS ARE APPROXIMATE

LEGEND

MW-2 ⊕ MONITORING WELL

A-A' GEOLOGIC CROSS-SECTION

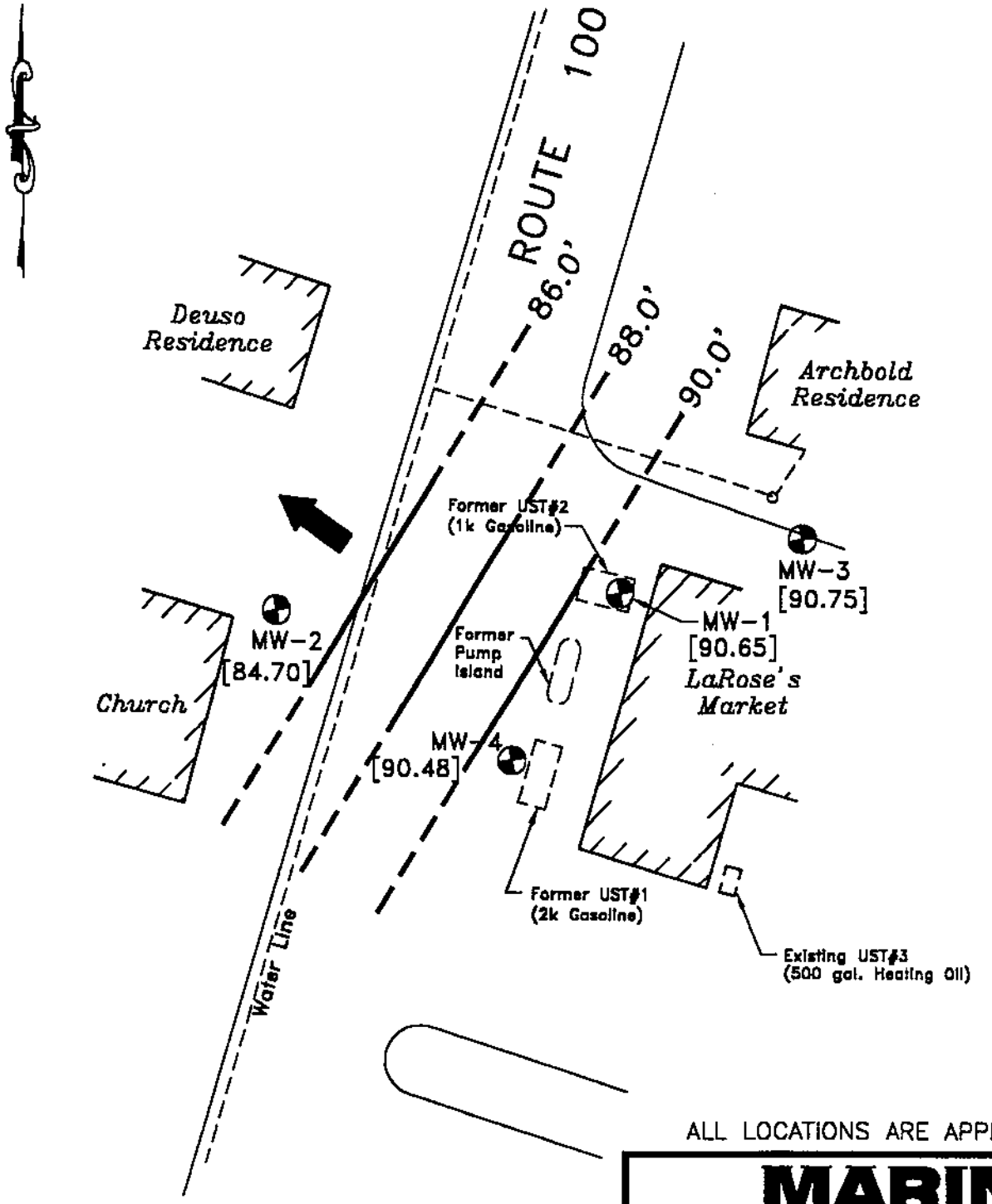
MARIN
ENVIRONMENTAL

SITE:
LAROSE'S MARKET
NORTH HYDE PARK, VT

TITLE:
FIGURE 2.
SITE MAP
With Monitoring Well Locations

1700 Hegeman Avenue
Colchester, VT 05446
(802) 655 - 0011

DRAWN BY: MJB	DATE: 11/02/98	SCALE: 1"= 30'
APPROVED BY: ES	FILE No.: 980088	



ALL LOCATIONS ARE APPROXIMATE

LEGEND

MW-2 ⊕ MONITORING WELL
[90.48'] WATER TABLE ELEVATION (FT.)
88.0' —— WATER TABLE ELEVATION CONTOUR (FT.)
⬅ INFERRED GROUND WATER FLOW DIRECTION

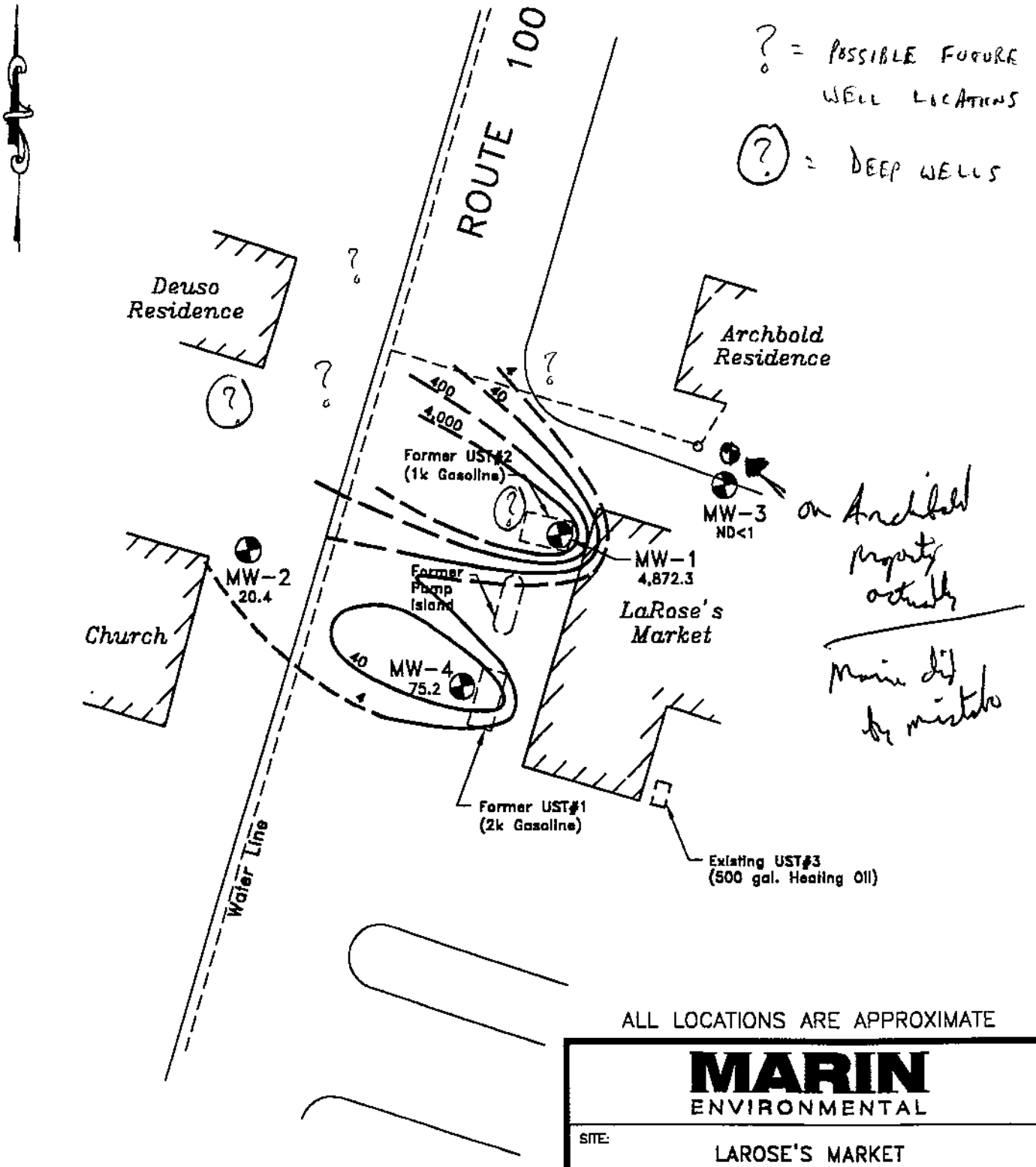
MARIN ENVIRONMENTAL

SITE: LAROSE'S MARKET
NORTH HYDE PARK, VT

TITLE: FIGURE 3.
WATER TABLE CONTOUR MAP
MONITORING DATE: 8 OCTOBER 1998

1700 Hegeman Avenue
Colchester, VT 05446
(802) 655 - 0011

DRAWN BY: MJB	DATE: 11/02/98	SCALE: 1"= 30'
APPROVED BY: ES	FILE No.: 980088	



ALL LOCATIONS ARE APPROXIMATE

LEGEND

MW-2 ⊕	MONITORING WELL
—	Total VOCs Contour (ppb)
ND	None Detected

Note: Total VOCs EPA Method 8021b.

MARIN
ENVIRONMENTAL

SITE:
LAROSE'S MARKET
NORTH HYDE PARK, VT

TITLE:
FIGURE 4.
CONTAMINANT DISTRIBUTION MAP
MONITORING DATE: 8 OCTOBER 1998

1700 Hegeman Avenue
Colchester, VT 05446
(802) 655 - 0011

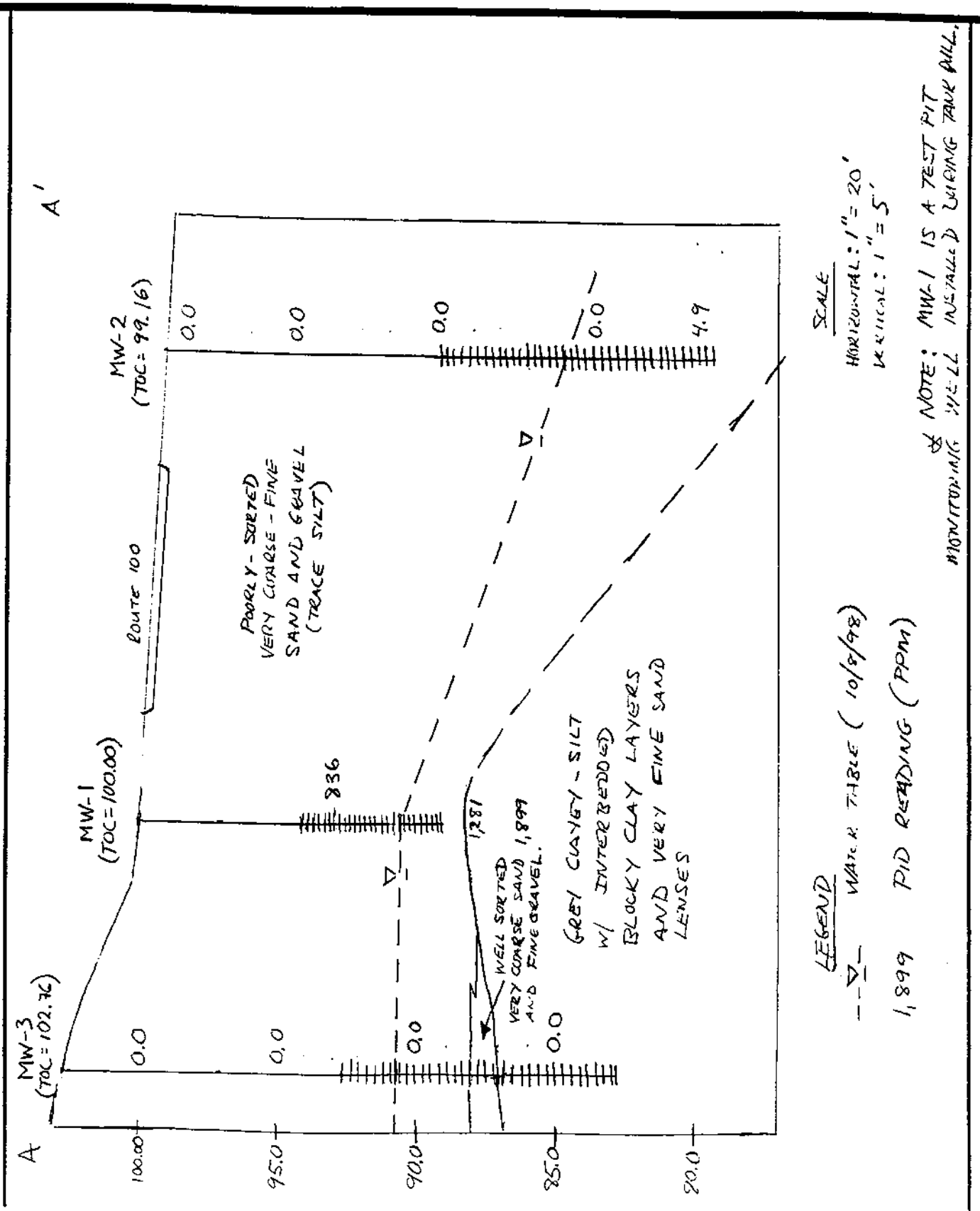
DRAWN BY: MJB	DATE: 11/02/98	SCALE: 1"= 30'
APPROVED BY: ES		FILE No.: 980088

Marin Environmental, Inc.

7 Island Dock Road
Haddam, CT 06438

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
EJS	11/9/98			VT98-0084

SUBJECT: LAROSE'S MARKET — GEOLOGIC X-SECTION A-A'



SCALE
HORIZONTAL: 1" = 20'
VERTICAL: 1" = 5'

LEGEND
-▽- WATER TABLE (10/5/98)
1,899 PID READING (PPM)

* NOTE: MW-1 IS A TEST PIT INSTALLED USING TRUCK MOUNTED AUGERS

APPENDIX B

Boring Logs /Monitoring Well Construction Diagrams

Marin Environmental, Inc.

SITE NAME: LAROSE'S MARKET
LOCATION: N. HYDE PARK, VT
JOB NO. VT 98-0088
DATE: 9/18/98

BORING NO: MW-1
TOTAL DEPTH: 11.0'
DEPTH TO WATER: 9.35' BELOW TOC
10/8/98

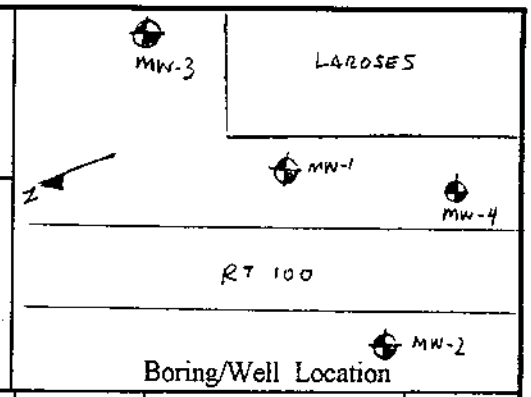
DRILLING METHOD
EXCAVATOR

FIELD SUPERVISOR: JAY GONYA

BORING DIAMETER
—

CONTRACTOR: MARIO PAUL EXCAVATING

DRILLERS:



Boring/Well Location

Depth (ft)	Sample No.	BLOW COUNTS PER 6" 0-6	6-12	12-18	18-24	Rec. (ft)	SAMPLE DESCRIPTION	STRATA	WELL DETAIL	PID (ppm)
5'								SAND & GRAVEL	EXPANSION 1.0' CAP; 2" PVC 0.010 SCREEN; NATIVE BACKFILL	936.0
10'								SILT	11.0'	1,281; 1,899
15'										
20'										
25'										

AND	33-50%
SOME	20-33%
LITTLE	10-20%
TRACE	0-10%

BLOW COUNT	
0 - 4	VERY LOSE
4 - 10	LOOSE
10 - 30	MEDIUM
30 - 50	DENSE
> 50	VERY DENSE

MATERIALS USED	SIZE/TYPE	QUANTITY
WELL SCREEN		
SLOT SIZE		
RISER		
GRADED SAND		
BENTONITE PELLETS		
BENTONITE GROUT		

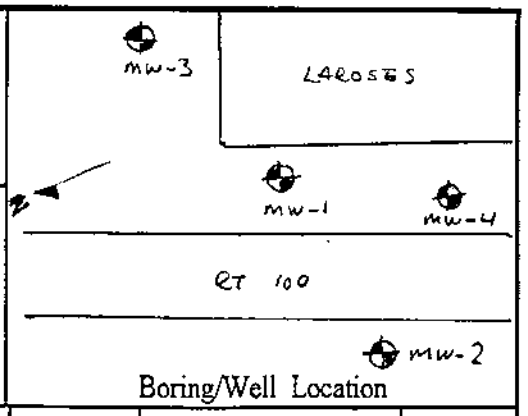
Marin Environmental, Inc.

SITE NAME: LAROSE'S MARKET
LOCATION: N. HYDE PARK, VT
JOB NO. VT 98-0088
DATE: 10/2/98

BORING NO: MW-2
TOTAL DEPTH: 20'
DEPTH TO WATER: 14.46' BELOW TOC (10/9/98)

DRILLING METHOD: VIBRATORY CORING
BORING DIAMETER: 2 3/4"

FIELD SUPERVISOR: ERIC SWIECH (MARIN)
CONTRACTOR: ADAMS ENGINEERING (GERRY ADAMS)
DRILLERS:



Boring/Well Location

Depth (ft)	Sample No.	BLOW COUNTS PER 6" (0-6 / 6-12 / 12-18 / 18-24)	Rec. (ft)	SAMPLE DESCRIPTION	STRATA	WELL DETAIL	PID (ppm)
				BRN VC-M SAND, AND VC GRAVEL (LARGE COBBLES). MOIST.	SAND + GRAVEL	EXPANSION CAP; BACKFILL	0.0
			3.5			2.5'	0.0
				* REFUSAL @ 6.8' BGS, MOVED BORING 4' SOUTH AND CONTINUED.		BENTONITE CHIPS 4.5'	0.0
5'				SAME AS ABOVE, EXCEPT DRY.			0.0
			3.0			1.5" PVC RISER	0.0
10'				REFUSAL @ 10.8'. USED DRAG BIT TO 15' (NO SAMPLE).		#1 SAND 10.8'	
						0.010 SCREEN ▽	
15'				BRN VC-M SAND, AND VC-F GRAVEL (SUB-ROUNDED) PEBBLES + COBBLES), TRACE SILT (POORLY SORTED). MOIST-WET. BRIGHT ORANGE MOTTLING @ ~16'.			0.0
			5.0				
20'				END OF BORING @ 20' BGS. SET WELL. + DEVELOPED W/ PERISTALTIC IMMEDIATELY AFTER INSTALLATION		20.0'	4.9
25'							

AND	33-50%
SOME	20-33%
LITTLE	10-20%
TRACE	0-10%

BLOW COUNT	
0 - 4	VERY LOSE
4 - 10	LOOSE
10 - 30	MEDIUM
30 - 50	DENSE
> 50	VERY DENSE

MATERIALS USED	SIZE/TYPE	QUANTITY
WELL SCREEN		
SLOT SIZE		
RISER		
GRADED SAND		
BENTONITE PELLETS		
BENTONITE GROUT		

Marin Environmental, Inc.

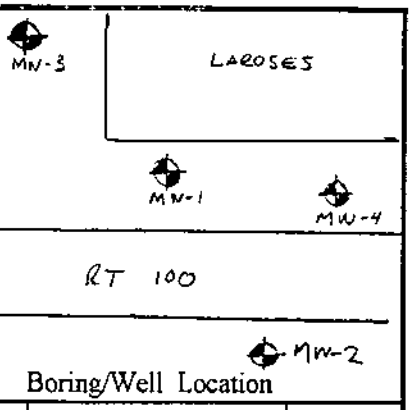
SITE NAME: LAROSE'S MARKET
LOCATION: N. HYDE PARK, VT
JOB NO. VT 98-0088
DATE: 10/2/98

BORING NO: MW-4
TOTAL DEPTH: 15'
DEPTH TO WATER: 9.03 BELOW TOC (10/8/98)

DRILLING METHOD: VIBRATORY CORING
FIELD SUPERVISOR: ERIC SWIECH

BORING DIAMETER: 2 3/4"
CONTRACTOR: ADAMS ENGINEERING (GERRY ADAMS)

DRILLERS:



Boring/Well Location

Depth (ft)	Sample No.	BLOW COUNTS PER 6" (0-6 / 6-12 / 12-18 / 18-24)	Rec. (ft)	SAMPLE DESCRIPTION	STRATA	WELL DETAIL	PID (ppm)
				TOP 1.5' = GREY VC-F SAND, SOME SILT + GRAVEL, DRY. NEXT 1.0' = BRN F-VF SAND AND SILT, LITTLE GRAVEL. WET. BOTTOM 2.5' = BRN VC-VF SAND AND GRAVEL, LITTLE SILT, DRY	POORLY-SORTED SAND + GRAVEL	EXPANSION CAP 1.5' BENTONITE CHIPS 3.5 1.5" P/C RISER 5.0 #1 SAND	0.0
			5.0				0.0
5'							0.0
							0.0
			5.0	SAME AS ABOVE			
10'							0.0
				TOP 0.5' = SAME AS ABOVE. NEXT 3.5' = BRN SILT, W/ OCCASIONAL VF SAND LENSES. BOTTOM 1.0' = GREY SILT, W/ CLAY LAYERS.	SILT	0.010 SCREEN	0.0
			5.0				4.2
15'						15.0'	8.3
				END OF BORING @ ~15' SET WELL. WELL DEVELOPED ON 10/8/98 W/ BAILER.			
20'							
25'							

AND	33-50%
SOME	20-33%
LITTLE	10-20%
TRACE	0-10%

BLOW COUNT	
0 - 4	VERY LOSE
4 - 10	LOOSE
10 - 30	MEDIUM
30 - 50	DENSE
> 50	VERY DENSE

MATERIALS USED	SIZE
WELL SCREEN	
SLOT SIZE	
RISER	
GRADED SAND	
BENTONITE PELLETS	
BENTONITE GROUT	

boring log for MW-3 missing

APPENDIX C

Laboratory Report Forms

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

REPORT OF LABORATORY ANALYSIS

CLIENT: Marin Environmental
PROJECT NAME: Larose's Market
REPORT DATE: October 20, 1998
DATE SAMPLED: October 8, 1998

PROJECT CODE: GWVT1095
REF.#: 128,693 - 128,698

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. Chain of custody indicated sample preservation with HCl.

All samples were prepared and analyzed by requirements outlined in the referenced method and within the specified holding times. All instrumentation was calibrated with the appropriate frequency and verified by the requirements outlined in the referenced method. Blank contamination was not observed at levels affecting the analytical results.

Analytical method precision and accuracy was monitored by laboratory control standards which included matrix spike, duplicate and quality control analyses. These standards were determined to be within established laboratory method acceptance limits.

Individual sample performance was monitored by the addition of surrogate analytes to each sample. All surrogate recovery data was determined to be within laboratory QA/QC guidelines unless otherwise noted.

Reviewed by,

Harry B. Locker, Ph.D.
Laboratory Director

enclosures

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

EPA METHOD 8021B--PURGEABLE AROMATICS

CLIENT: Marin Environmental
PROJECT NAME: Larose's Market
CLIENT PROJ. #: 980088

DATE RECEIVED: October 9, 1998
REPORT DATE: October 20, 1998
PROJECT CODE: GWVT1095

Ref. #:	128,693	128,694	128,695	128,696	128,697
Site:	MW-1	MW-2	MW-3	MW-4	Dup
Date Sampled:	10/8/98	10/8/98	10/8/98	10/8/98	10/8/98
Time Sampled:	9:30	9:45	9:55	10:00	NI
Sampler:	E.S.	E.S.	E.S.	E.S.	E.S.
Date Analyzed:	10/16/98	10/16/98	10/16/98	10/16/98	10/19/98
UIP Count:	>10	>10	0	>10	>10
Dil. Factor (%):	5	100	100	100	5
Surr % Rec. (%):	95	103	81	88	93
Parameter	Conc. (ug/L)	Conc. (ug/L)	Conc. (ug/L)	Conc. (ug/L)	Conc. (ug/L)
MTBE	<20	<1	<1	12.3	<20
Benzene	<20	<1	<1	7.2	<20
Toluene	231.	<1	<1	1.5	242.
Ethylbenzene	87.3	4.9	<1	3.5	87.1
Xylenes	1,790.	10.1	<1	34.9	1,890.
1,3,5 Trimethyl Benzene	757.	TBQ <1	<1	3.9	776.
1,2,4 Trimethyl Benzene	1,750.	5.4	<1	9.7	1,820.
Naphthalene	257.	<1	<1	2.2	242.

Ref. #:	128,698
Site:	Trip Blank
Date Sampled:	10/8/98
Time Sampled:	9:00
Sampler:	E.S.
Date Analyzed:	10/17/98
UIP Count:	0
Dil. Factor (%):	100
Surr % Rec. (%):	92
Parameter	Conc. (ug/L)
MTBE	<1
Benzene	<1
Toluene	<1
Ethylbenzene	<1
Xylenes	<1
1,3,5 Trimethyl Benzene	<1
1,2,4 Trimethyl Benzene	<1
Naphthalene	<1

Note: UIP = Unidentified Peaks TBQ = Trace Below Quantitation NI = Not Indicated

ENDYNE, INC.

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333

28875

CHAIN-OF-CUSTODY RECORD

Project Name: LAROSE'S MARKET Site Location: N. HYDE PARK, VT	Reporting Address: MARIN ENVIRONMENTAL	Billing Address: MARIN 11480088
Endyne Project Number: GWVT1095	Company: MARIN Contact Name/Phone #: ERIC SMITH/ [illegible] 3011	Sampler Name: ES Phone #:

Lab #	Sample Location	Matrix	GRAB	COMP	Date/Time 10/8/98	Sample Containers No.	Sample Containers Type/Size	Field Results/Remarks	Analysis Required	Sample Preservation	Rush
128693	MW-1	H_2O	X		930	2	40 mL		8021b	HCL	
128694	MW-2	↓	↓		945	↓	↓		↓	↓	
128695	MW-3				955						
128696	MW-4				1000						
128,97	DUP				—						
128698	TRIP BLANK	↓	↓		900	↓	↓		↓	↓	

Relinquished by: Signature [signature]	Received by: Signature [signature]	Date/Time 10-8-98 1:07
Relinquished by: Signature	Received by: Signature [signature]	Date/Time 10/9/98

New York State Project: Yes ____ No ____

Requested Analyses

1	pH	6	TKN	11	Total Solids	16	Metals (Specify)	21	EPA 624	26	EPA 8270 B/N or Acid
2	Chloride	7	Total P	12	TSS	17	Coliform (Specify)	22	EPA 625 B/N or A	27	EPA 8010/8020
3	Ammonia N	8	Total Diss. P	13	TDS	18	COD	23	EPA 418.1	28	EPA 8080 Pest/PCB
4	Nitrite N	9	BOD_5	14	Turbidity	19	BTEX	24	EPA 608 Pest/PCB		
5	Nitrate N	10	Alkalinity	15	Conductivity	20	EPA 601/602	25	EPA 8240		
29	TCLP (Specify: volatiles, semi-volatiles, metals, pesticides, herbicides)										
30	Other (Specify):										